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...there are other things to consider

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Vol. 17 APRIL, 1940 No. 4

CONTENTS

ORIGINAL PAPERS

A Report of a Case of Convergence Insufficiency with Presbyopia (a C3 Type Case), with Some Additional Remarks Upon Prism Therapy. Clarence W. Morris 145

The Use of Ultra-Violet Light and Fluorescein in the Fitting of Contact lenses. John C. Neill 153

The Discovery and Commercial Development of Polaroid. Thomas Guion . 156

CURRENT COMMENTS by CAREL C. KOCH

A Non-Cycloplegic Method of Fundus Photography 165

A.O.A. Annual Congress 168

EDITORIALS

A Review of Certain Ocular Cases in Which Sub-Normal Vision Was Improved 169

PROCEDURE AND INSTRUMENTATION by G. L. DuPLESSIS

The Higley Depthoscope 176

Glazer on the Cause of Primary Glaucoma 177

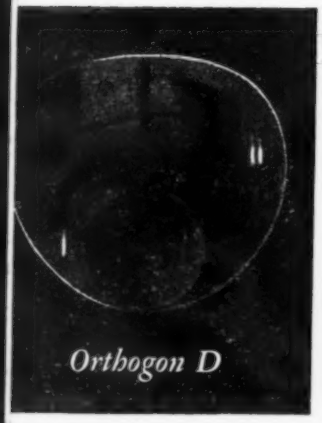
Eye Movement Photography 185

ORGANIZATION AND JURISPRUDENCE by CLARENCE W. MORRIS

Orientation of Optometric Policies Due to Failure to Understand Public Relations 185

BOOK NOTICES

An Introduction to the Mathematics of Ophthalmic Optics. Paul Boeder . . . 192



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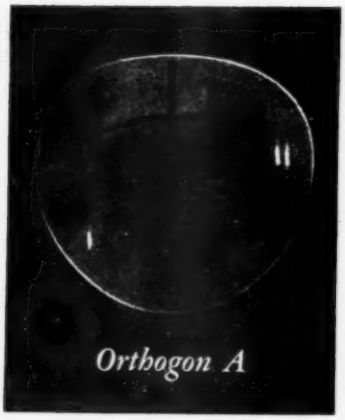

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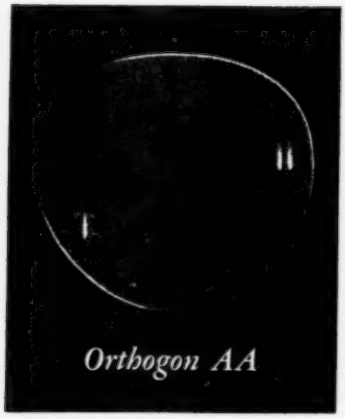

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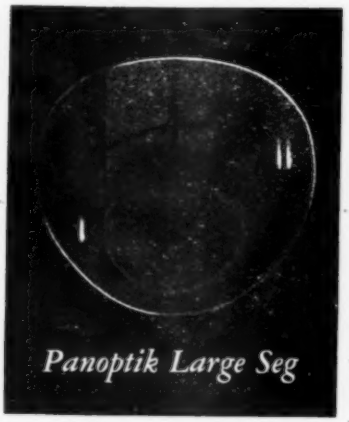

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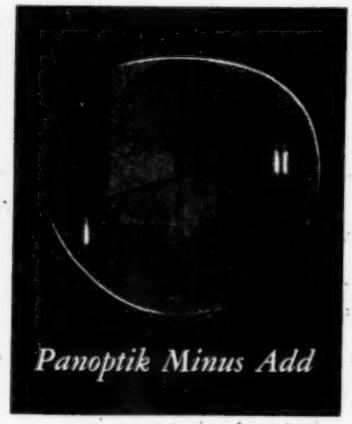

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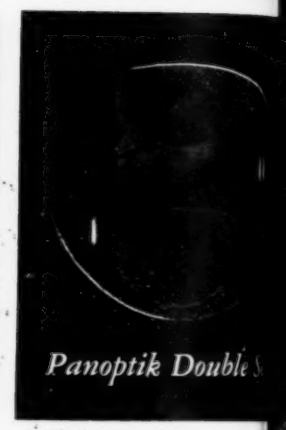

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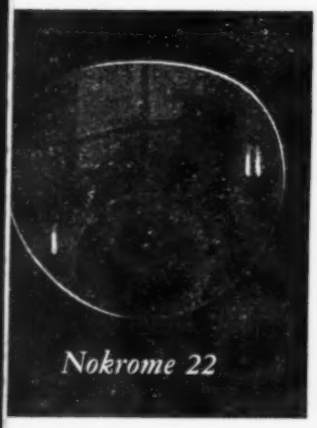

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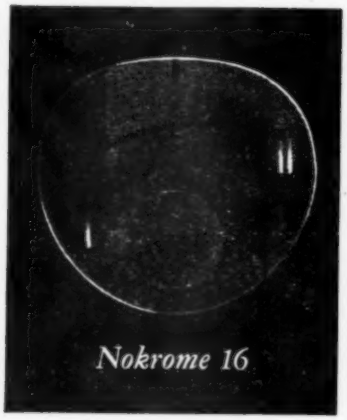

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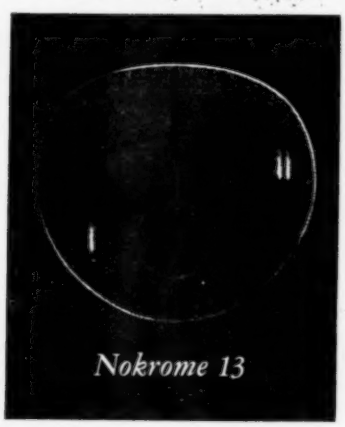

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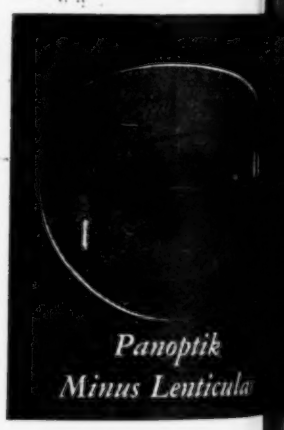

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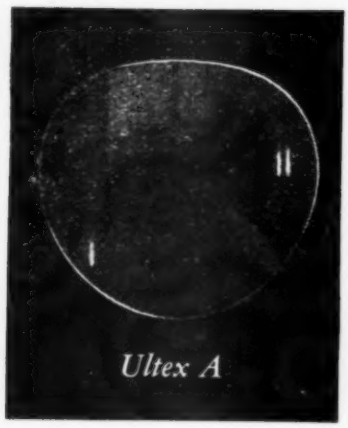

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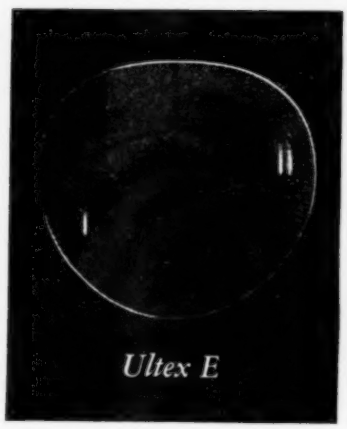

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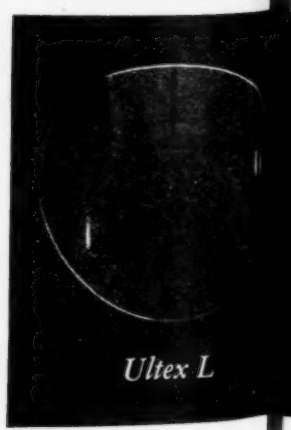

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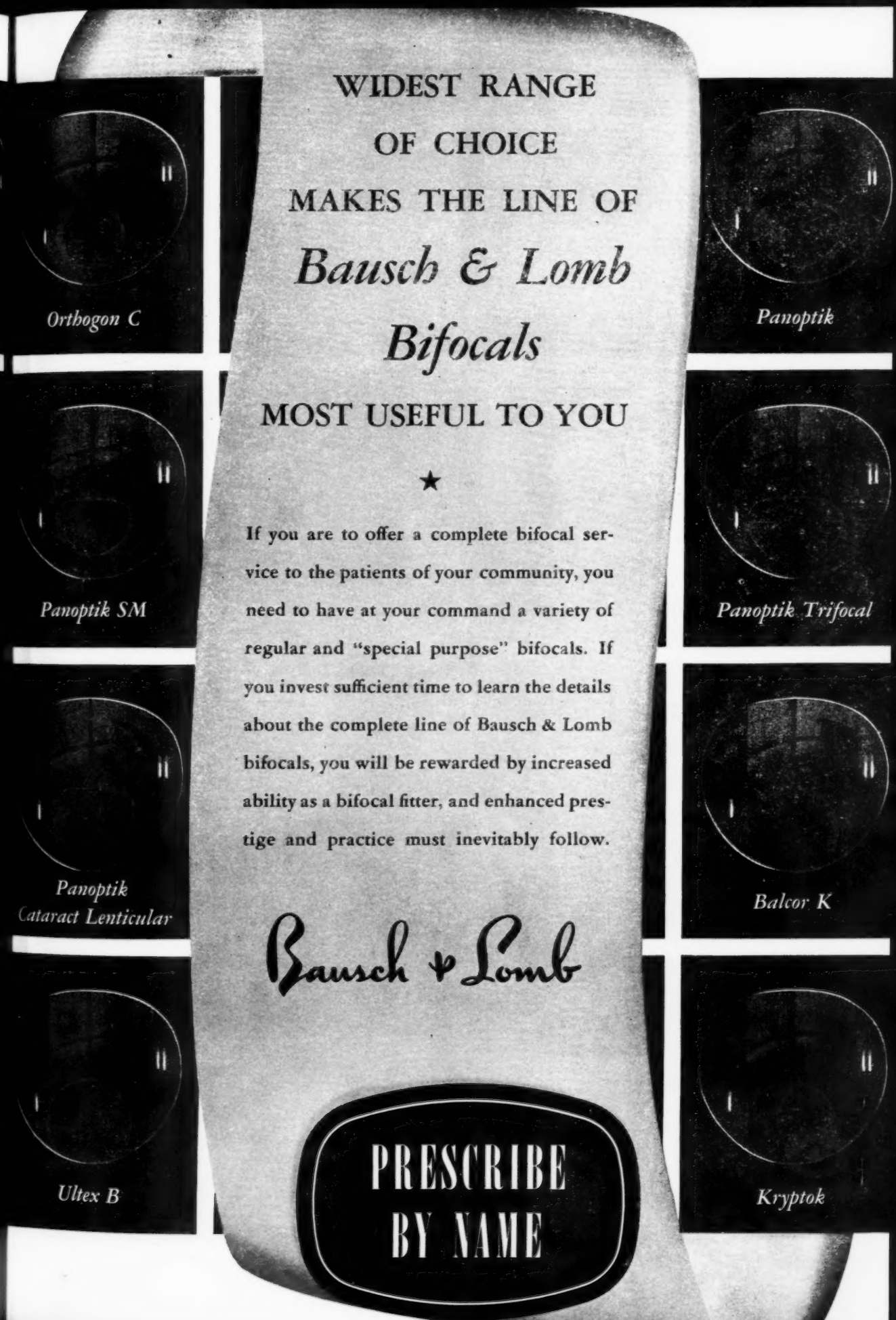
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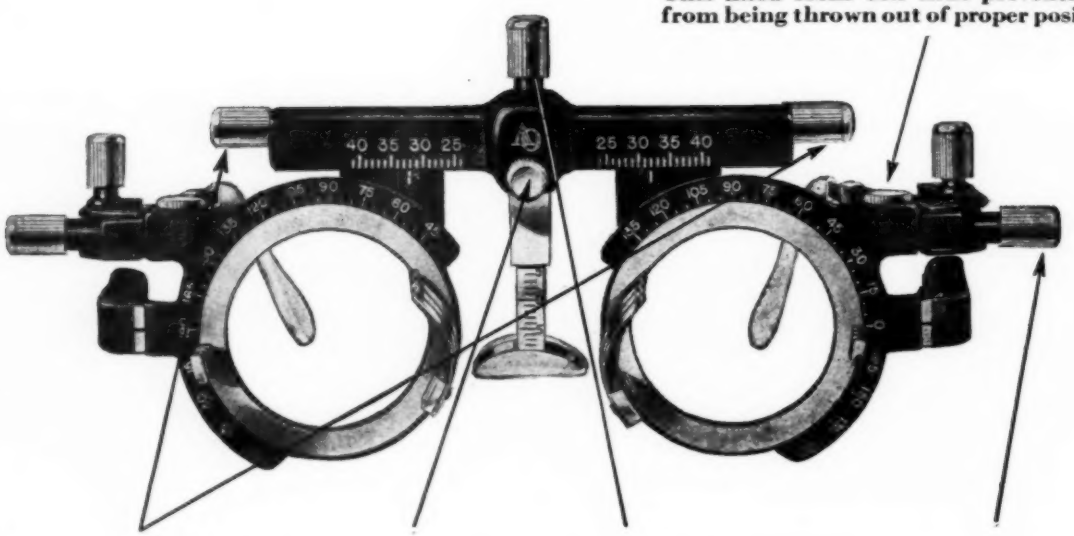

These knobs at ends of bar control pupillary adjustment for each eye.

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The papers and reports are original and are accepted only with the understanding that they are to be published in this journal exclusively.

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I. Write on one side of the paper. Double-spaced, typewritten MS. is preferred.

II. Words to be printed in *italics* should be underscored once, in SMALL CAPS twice, and in LARGE CAPITALS three times. **Antique type** when called for should be so marked.

III. Be sure that the title of your paper indicates its contents. Should the subject be a general one, for instance, Case Reports, it would be well to mention the subject of each special report—for instance: Case One. Progressive Myopia with Exophoria. Case 2. Divergent Squint with Amblyopia. These special titles will appear in the table of contents of each number.

IV. Illustrations should be carefully drawn on separate sheets.

V. When authors receive proofs for revision, they should correct and return these without delay. We beg, however, to remind our contributors that changes in the manuscript necessitates resetting, this causing much additional expense, so we ask that alterations be limited to what is of essential importance.

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AMERICAN JOURNAL OF OPTOMETRY

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A REPORT OF A CASE OF CONVERGENCE INSUFFICIENCY WITH PRESBYOPIA. (A C3 TYPE CASE) WITH SOME ADDITIONAL REMARKS UPON PRISM THERAPY*

Clarence W. Morris, M.A., Opt.D.
Fort Wayne, Ind.

Case No. 1098. Date: February 22, 1938. Age 54, Male. The patient is a laborer and lives twenty miles away in a small town.

General History

He reports good health. He does have some teeth which should be extracted, and there is a chronic nasal obstruction which reduces his resistance so that colds are frequent in the winter time.

Optometric History

He has never had his eyes examined. He is wearing a pair of ten cent store glasses which are not satisfactory. He reports satisfactory distant vision but he cannot see to read. He has no headaches. But sometimes his eyes burn and become red and watery.

External Examination and Ophthalmoscopy

His eye reflexes for light, direct and consensual, are normal. The cover test shows an excessive amount of exophoria. The near point of convergence is found at 13 cm. The color of the disc is red due to many small vessels. The disc is round with distinct margins and normal cupping. The retina is pale in color but the vessels are normal with no crossing phenomenon.

Refractive Data

No. 2 Plus 1.25x90
Plus 1.25x90

No. 3 4 Esophoria 13A 8 Exophoria

*Submitted for publication January 24, 1940.

No. 4 Plus 50 plus 50x90
Plus 50 plus 50x90

No. 5 Plus 2.50 plus 50x90
Plus 2.50 plus 50x90

No. 6 Plus 1.75 plus 50x90
Plus 1.75 plus 50x90

No. 7 Plus 50 (He does not accept subjectively any astigmatic
Plus 50 correction)

No. 8 1 Esophoria

No. 9 8 P.D. (Prism Diopters)

No. 10 16—12 P.D.

No. 11 2—0 P.D.

No. 12 Negative

No. 13B 10 Exophoria

No. 14A O.U. Plus 1.75 add

No. 15A 8 Exophoria

No. 14B O.U. Plus 1.75 add

No. 15B 8 Exophoria

No. 16A 8 P.D.

No. 16B 24— (—8) P.D. (Recovery at 8 P.D. base in)

No. 17A 8 P.D.

No. 17B 16—12 P.D.

No. 18 Negative

No. 19 Plus 1.00 (Duane minimum .87, average 1.25, maximum 2.00)

No. 20 Minus 1.25

No. 21 Plus 75

If one attempts to "type" this case according to the OEP technique, one possible classification would be C 3 type case. The method of handling would be to prescribe a bifocal correction and attempt to normalize certain functions by orthoptics until a more balanced equilibrium is obtained.

The writer finds the above method of analysis insufficient, in some respects, to give adequate expression to all the factors which must be taken into consideration in the handling of this case. Furthermore, the

OEP system of therapeutics, apparently, makes no provision for the utilization of prisms except as temporary instruments in diagnosis or treatment. Therefore this case, in the writer's opinion, requires a different method of analysis and a different therapeutic approach. The writer submits his own analysis.

1. The case is definitely convergence insufficiency. This is seen in the low No. 10 and in the negative recovery point in No. 16B. The writer believes that the low No. 11 and the low No. 17B are the results of the efforts to compensate for the convergence insufficiency. Those who are familiar with the OEP formulae for convergence insufficiency cases may think I am in error, but the OEP formulae for C type cases, I think, are correct when all efforts to compensate for the deficiency have been abandoned. In this case we find a radically different situation caused by the presence of compensation factor. In defense of the thesis that the factor of compensation is the key which unlocks the understanding of this case I submit the following observations.

1a. Facultative astigmatism is due to this factor of compensation. The horizontal meridians of the corneae are more flat than the vertical. In the efforts to "force" convergence the pull of the external recti upon the eyeball tend to increase the curvature of the corneae in the horizontal meridians. Also there is some associated ciliary response which might have an astigmatic value. Therefore, we find in this patient that, in spite of the fact that a half diopter of astigmatic correction is indicated by Nos. 2, 4, 5 and 6, the same is rejected by the patient in No. 7. In spite of the fact that an astigmatic correction was refused by the patient in the subjective refraction, the writer successfully obtained acceptance of a partial astigmatic correction as a consequence of attention toward reducing the effort associated with compensation for the convergence deficiency.

2a. Facultative Exophoria is also due to this factor of compensation. As a consequence of the efforts of the neuro-muscular mechanism to compensate for the deficient convergence faculty what is probably an exophoria or an orthophoria for distance has been converted into an esophoria. That is, No. 3 is 4 Esophoria while No. 8 is only 1 Esophoria.

3a. Facultative Exophoria at the near point is due to the factor of compensation. The cover test disclosed an exophoria which was excessive and therefore larger than 8 P.D. I regret that I did not measure this exophoria by the Duane technique with loose prisms. Furthermore,

the near point of convergence is only 13 c.m. Both of these tests indicate the probability of a larger near point phoria than 8 P.D.

4a. All four blur points are relatively low. This is also due to the "tightness" in these reflexes induced by this compensation factor. However, the possibility of some systemic focal infection, such as teeth and nasal conditions, may also be a factor to be considered.

2. There are other factors which are as important as refraction data which must be taken into consideration in making a prognosis and in the determination of the exact therapeutic measures to be recommended.

The patient is a laborer; therefore, his finances will be limited and the cost of orthoptics may be prohibitive. Furthermore, the fact that he is a laborer and has never worn other than convex glazed glasses indicates that his cultural activities are rather limited and perhaps a half hour in the evening with the daily newspaper may be the extent of the demand for near vision. In fact the patient came in for a pair of "reading glasses" only. The fact that he works long hours and would be required to make long trips after a hard day of manual labor if orthoptics were attempted make such unadvisable. It has been the experience of the writer that success with orthoptic cases is very difficult when the patient is fatigued with a day's work or by long trips to the office. Therefore, in the opinion of the writer, these factors contra-indicate orthoptics for this patient.

Since orthoptics is contra-indicated, what disposition shall be made of the convergence insufficiency? The writer's habit has been to prescribe base-in prisms in such cases. However, such prism power should never be prescribed without submitting the value of such correction to a subjective test. This may be done by holding a pair of 1.00 base-in before each eye. In near vision such prisms may make the print look more plain. In the case in question the patient was able to read the next smaller test type with the aid of prism power. Some patients will report no improvement in reading ability but will announce the sensation of a definite feeling of relief or absence of strain in reading at the near point with the aid of prisms. The subjective acceptance of prism power should also be estimated at distance. In all cases of convergence insufficiency or excessive exophoria one may safely prescribe prisms when orthoptics are contra-indicated, provided there is a subjective acceptance of same at the near point with not less than a toleration of same at the distant point.

However, the patient should be advised to expect considerable irregularities in the perception of space and distance. The walls may seem to be bowed and the floor may seem to rise up in a mound. These difficulties usually disappear in about two weeks' time.

The summation of the writer's analysis is that this case will get along very nicely with a small prism element in the upper part of the bifocal correction and that the same will be more satisfactory to the patient than the alternative of orthoptic exercises. Furthermore, with the inhibition of the excessive compensation for the convergence insufficiency at least a partial correction of the latent astigmatic error will be tolerated.

The writer prescribed the following correction:

O.D. + 0.50 D.Sph. ⌒ +0.25 D.Cyl. axis 90 ⌒ 1△ Base-in
O.S. +0.50 D.Sph. ⌒ +0.25 D.Cyl. axis 90 ⌒ 1△ Base-in

Presbyopic addition of plus 2.25 D.Sph.

The writer was consulted by this patient a year later for an adjustment and the patient expressed great satisfaction with the correction.

In concluding this case report the writer would like to make a few remarks upon the general subject of prism therapy in optometric practice. The writer can most vividly remember the statement he heard at various times when he first began the practice of optometry that "Prisms are poison and should never be used." The proponents of these ideas also said that if one began to wear prisms he would always have to wear prisms. In fact, they confidently asserted that if one once began to wear prisms he would be required to wear stronger and stronger prisms and eventually his eyes would be ruined.

My personal experience as an optometrist for the past thirteen years seems to indicate that all of these alleged objections to the use of prisms are idle speculations founded on pure imagination. Are prisms poison? One might just as well ask if a sphere or cylinder is poison. An examination of history, I believe, will show that when spherical corrections were first introduced they were considered as "poison." Later the same objection was raised against cylinders. So it is no surprise that ignorance of the value of prisms raises the same old lament.

A sphere or cylinder may be poison to a patient when it is not needed. Likewise the prism, if it is improperly used, may be poison. The difficulty does not rest with the instrument so much as with the one who seeks to manipulate the instrument. The prism does have greater

ability to disorganize space and distance perception than is the case, perhaps, with the lowly sphere; but in compensation therefore, it possesses greater powers of emendation. Perhaps the methods of the writer will be condemned by some scientific minded men as empirical. That may be true but just as soon as he finds a more scientific method or basis for prescribing of prisms, we hope he will be sufficiently receptive to adopt the new and discard the old.

The writer recently read a text book which sets forth the OEP technique. In many respects, it is a very valuable book but the writer was somewhat disturbed to discover that orthoptics was used in a very narrow sense. In this text (*Analytical Refraction and Orthoptics* by Dvorine) one finds no mention of prism therapy except as diagnostic instruments or temporary therapeutic agents. The use of prisms as a permanent element in a correction is apparently not recognized. Without prisms practically all squint cases are impossible of solution. To be sure there are exceptions but they are rare. The writer once cured an extreme case of convergent squint in 24 hours by the application of a refractive correction. But that happened only once in a period of years. Perhaps the lack of knowledge of prism therapy accounts for the fact that some optometrists confine their orthoptic work to the normalizing of various findings. When called upon to treat a squint case they turn it over to some other eye man. The writer confesses that he would be most happy to take on as many non-operative squint cases as time permits.

Let me present a typical squint case. Six years ago a young man with the complaint of eye strain presented himself for an examination. After making the refraction, I informed him that the cause of his trouble was due to the fact that he was using one eye only. His right eye deviated up and outward. There was a total neutralization in the central fields of the right eye. I prescribed a temporary sphero-cylinder correction and began orthoptic treatments, these to be given three times each week.

With total neutralization of vision in the right eye there was no fusion. It was three months before the first grade of fusion was obtained. Then it was possible to measure the deviation subjectively and apply the correcting prisms which created orthophoria. It was three or four months more before the second and third grades of fusion were established. Then for several months we attempted to develop amplitude in these functions and reduce the supporting prism elements down to the minimum. The

case was completed in about one year. The writer has seen this patient every year since and finds his ability to maintain binocular vision is constantly improving. At the last visit it was found that his eyes are now so habituated to binocular vision that for long periods of time, he can go without his prismatic correction and still maintain comfortable binocular vision.

If this case were handled with orthoptics without the use of prisms for permanent wear, it is inconceivable how any satisfactory results could have been attained. By means of prisms the faculty of binocular vision was sustained during a period when the neuro-muscular mechanism was strengthening the recently acquired reflex control of this function. Now we are approaching a time when the prismatic elements can be further reduced. That will probably be the next step the writer will take in the evolution of a normal binocular function for this patient. I might add that the writer was very fortunate in this case because the patient was most cooperative. All that we have accomplished in this case with prism therapy is the removal of a handicap which gave nature an opportunity to effect a cure. But it has taken six year's time for nature to progress to the point where a reduction in prism power is possible.

If the reader will pardon a personal reference, the writer would like to cite his own case as a final point in this discussion. When a student, he had between 8 and 10 diopters of Exophoria for distance and 25 to 28 diopters of Exophoria for near. At no time was he able to use his eyes continuously for more than thirty minutes without great fatigue which would cause him to fall asleep at his desk. After a half hour or more of sleep he would wake up and study again for another period when he would be compelled by fatigue to rest. Sometimes rest was obtained by walking around the block in order to conserve time between periods of study.

In 1927 the writer became aware of the success of Peckham with prism therapy in myopic cases. Encouraged by these reports he ventured to apply prisms in his correction in spite of the dire predictions that prisms were poison and would ruin one's eyes. Shocked were the optical laboratory employees who ground the prescription with eight diopters of prism. But what relief they gave! Instead of a niggardly thirty *minutes*, hours of sustained reading without fatigue were now possible. With the passing of the years the prism element was reduced to six, to five, to four and later to three diopters. There has also been an improve-

ment in the eyes. The excessive phorias have been eliminated. The convergence amplitude is now almost normal. But there has been a definite increase in myopia and all astigmatism has become manifest. However, these changes have normalized the visual function.

In conclusion, we believe that optometry should take recognition of these theories of orthoptics which repudiate prism therapy and thus discourage optometrists from following methods which are essential to the successful handling of the majority of orthoptic patients. Any system of optometric therapeutics which restricts optometrists to an insignificant portion of the orthoptic patients and in effect hands over to other professions all non-operative squint patients demands some investigation.

Furthermore, this field of prism therapy in orthoptics is a field in which there is an educational opportunity to render some optometrists and many thousands of squint patients a most valuable service. If optometrists would refer their squint cases to optometric clinics, perhaps, with the proper cooperation from such clinics, these same optometrists might in time acquire the art of prism therapy and the technique of handling non-operative squint cases.

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THE USE OF ULTRA-VIOLET LIGHT AND FLUORESCEIN IN THE FITTING OF CONTACT LENSES*

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During the past few years a number of writers have described a method for determining the fit of a contact lens by the use of a solution of fluorescein, a coal tar dye. In 1937 Obrig[1] described his method of instilling the fluorescein and estimating by means of the greenish-yellow color produced by the dye, how much of the scleral band was resting on the eye. He also suggested that a valuable record of each trial fit could be made by drawing the pattern seen with the fluorescein.

In addition to its use in detecting scleral fit, fluorescein has also been valuable in estimating the clearance between the anterior surface of the cornea and the posterior surface of the contact lens, as well as the clearance at the limbus.

Previous to its use in the fitting of contact lenses the value of fluorescein had long been appreciated for detecting abrasions and cuts of the cornea and in differentiating between old and new scars, outlining ulcers, etc. Its use in such instances is based upon the fact that fluorescein will only stain the corneal epithelium where its continuity has been interrupted.

In my experience there have been several objections to the use of fluorescein as described above. Stated briefly they are as follows: In order to obtain a sufficient depth of color for the solution to be effective it is necessary to use a one or two per cent solution; since the dye is but very slightly soluble in water with a pH of 7 it is necessary to raise the pH to about 9. This is usually accomplished by adding an alkaline such as sodium bicarbonate to the water in which the fluorescein is to be dissolved. Such a strongly alkaline solution is somewhat irritating to the eye and a solution which more nearly matches the pH of the tears would be pref-

*Submitted for publication March 26, 1940.

erable. A more serious objection to the use of a solution containing as much as two per cent of fluorescein is the deep orange-yellow stain imparted to clothing, towels and any flesh with which it comes in contact. It is next to impossible to keep from spilling some of the solution when inserting and removing the lens; these stains are quite resistant and are particularly objectionable to feminine patients who resent the streaking of their faces and make-up.

For some time I have been experimenting with weaker solutions of fluorescein but have found that when the strength was decreased to a point where the dye could be more readily removed from the skin, its value as a diagnostic agent was correspondingly reduced. These experiments were all carried out on actual patients in my office and an ordinary tungsten filament electric light was used as the source of illumination when inspecting the contact lens filled with a weak fluorescein solution.

More recently I have been using these same weak solutions but making the observations with the aid of an ultraviolet light source. Under the influence of this light even the weakest solutions fluoresced to a beautiful green so that the fit could be more readily determined than when a stronger solution was used and inspection carried out with ordinary light.

For a source of ultraviolet illumination I have experimented with several different kinds that are commercially available. These ultraviolet sources were designed primarily for producing fluorescent stage effects and are provided with filters that absorb most of the visible spectrum. All of these lamps are of the mercury vapor type and were designed to provide ultraviolet light from that portion of the spectrum just below the visible; such rays are harmless when directed at the eye. These lamps require a special reactor or transformer for operating on 110 volt A. C. Hague[2] has recently announced the development of a lamp of this type specifically designed for use in cataract surgery. While as yet his lamp is not available, it is shortly to be placed on the market by the *American Optical Company*.

The amount of ultraviolet light required in contact lens fitting is relatively low and I have found that an ordinary two watt Argon gas filled glow lamp will serve the purpose admirably. These lamps are manufactured by both *General Electric* and *Westinghouse* and may be purchased in any lamp store. This lamp fits any standard socket and operates on 110 volts A. C. or D. C. without the need for a reactor. On A. C. the entire plate lights up; on D. C. only half. The Argon lamp furnishes

ultraviolet light directly without a filter. The rays emitted are not completely dark but can be made darker by enclosing the lamp in a reflector fitted with an ultraviolet filter.

A very practical experimental ultraviolet lamp (figure 1) consisting of a two watt Argon glow lamp, a three-inch reflector, switch and cord, attachment ring and ultraviolet disc filter can be obtained from the *Stroblite Company*, 35 West Fifty-second Street, New York City.

Fig. 1 (Neill). Argon Ultraviolet Source With Reflector and Filter. (Stroblite Company)

I have used this lamp both with and without the ultraviolet filter for several months and have found it invaluable in the fitting of contact lenses.

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THE DISCOVERY AND COMMERCIAL DEVELOPMENT OF POLAROID*

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Look back for a moment through the ages—back to the time when man sat in a cave, chipping stone into arrow heads by the flickering light of his fire. That was the only light he could make. Now look forward, far forward, to Abraham Lincoln, reading his books in the glare of burning logs. Candles and oil lamps had been invented, but the light of his fire was the only light that young Abe could afford. Into the short space of time since Lincoln's youth, practically all progress in lighting has been packed, and the final big step to light that is free from glare has only just been taken.

Glare is more than annoying: it is harmful. Within the eye is a substance known as the "visual purple," which in vision may be compared to the silver nitrate in a photographic film. Severe exposure to glare bleaches out the visual purple, producing temporary blindness. Our bodies can restore the visual purple to normal only through the agency of vitamin A. If we have enough in our system, vision is soon brought back to normal. Usually we do have enough, but many people do not and their sight may suffer permanent injury.[1]

The dazzle of glare is everywhere. It stabs the eyes from the surfaces of water, beaches, roadways, tennis courts, golf links, and sky runs. Best known and most feared are the blinding headlights from which glare collects an estimated toll of 20,000 lives a year.[2] The public tries to hide its eyes from glare whenever it can from behind visors on wind shields and from behind sun glasses and visors on hats. That the majority of the public realizes the importance of glare-preventing aids is attested by the enormous sale of sun glasses of every kind and quality. Any protection that minimizes glare is sought after. Now comes a new invention to assist in this war upon glare—Polaroid.

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For centuries scientists have sought a new basic way to control light. Their contributions were important, but their accomplishments were little more than curiosities of science.

In 1670 Bartholinus discovered double refraction in iceland spar. The Polarization of light by reflection was first noticed by Malus in 1811, when looking through a calcite crystal, he saw it eliminate the glare of a brilliant afternoon sun reflected from palace windows. The Nicol prism was invented by William Nicol in 1828.[3] It is exceedingly valuable, as it gives a beam of light that is completely polarized and entirely without color, when the incident light is white.

The development of practical applications of wave optics was impeded by a formidable obstacle. Polarization was well-known and understood, but no cheap and convenient means of polarizing light were available. The production of polarized light has long been identified with the Nicol prism. Unfortunately, this device is expensive, very limited in its aperture and field of view, and not always easy to adjust in an optical system. It is all too easily damaged by heat radiated from intense sources of light. These limitations of the Nicol prism may be avoided by utilizing the polarization of light produced by reflection from a glass plate at Brewster's angle or by transmission through an inclined pile of several superposed glass plates. In the former case polarization is nearly perfect but the relative intensity of the light is low. In the latter case, the relative intensity may be satisfactorily large, but the corresponding degree of polarization is low. In all cases, these contrivances are inconveniently cumbersome.[4]

Dr. William Bird Herapath in 1852, discovered with his microscope that crystals of iodo-quinine sulfate ($4C_{20}H_{24}N_2O_2 \cdot 3\,H_2SO_4 \cdot 2\,HI \cdot I_4 \cdot 3\,H_2O$) possesses the property of polarizing light to a remarkable degree. He well knew the value of his discovery, and his enthusiasm flowered into a series of articles in the PHILOSOPHICAL MAGAZINE, each describing a new attempt to grow the fragile and unstable crystals into sheets of large area. He failed but, as a result of his enthusiastic and eloquent descriptions, the compound acquired the name of Herapathite. His frank admission of his failure left physicists convinced that his discovery was of negligible importance.[5]

It is a curious property of research activity that after a problem has been solved, the solution usually seems obvious. The process employed in the manufacture of Polaroid was derived by antithesis from Dr. Herapath's valiant efforts. The opposite procedure of using extremely

small crystals was the solution.

A mass of Herapathite crystals of such small size that they cannot be seen with a high-powered miscroscope, but with their polarizing axes all turned the same way in uniform orientation, produces the effect of a single large crystal.

Heretofore, suspension of Herapathite has been produced in which the suspended particles were small, but yet clearly visible under an ordinary microscope. No suspension of truly colloidal particles of Herapathite has been produced, despite repeated efforts. It appeared that such truly colloidal particles could not be produced at all, and that even the microscopic particles could not be produced satisfactorily. It appeared, furthermore, that suspension of the microscopic particles could not readily be secured in nitrocellulose.[6]

These difficulties remained unsolved mysteries of the laboratory until the invention of Polaroid by Edwin H. Land. The story of Polaroid is an inventor's story on the classical model, with Land, who is now twenty-nine, in complete control of Polaroid Corporation.

No overnight development, Polaroid is the product of fifteen years research. While still a boy in his teens, Land was attracted by the astonishing properties of polarized light. George K. Wheelright III was a physics instructor at Harvard when Land signed up for one of his courses. They used to engage in long after-class discussions. Land had a shock of black hair, dark piercing eyes, a jerky manner, and a sophisticated but incurable enthusiasm about almost everything in the world, but especially about a light polarizer that he had devised in a rudimentary home laboratory. His pet idea bothered him so much that he finally took a leave of absence. He became the only undergraduate ever to be given a research laboratory of his own at Harvard. Wheelright joined forces with the precocious genius who was his pupil. In addition to his thorough knowledge of physics and a keen sense of judgment regarding human nature, he had money. It was a perfect team.[7]

In the spring of 1929, Land had completed his researches in the formulation of the fundamental principles for the preparation of polarizing sheets. In doing this he made practical application of the results described by Cotton and Mouton about twenty-five years ago. They had succeeded in the preparation of permanent magnets by orienting colloidal solutions of iron. Magnetic double refraction has also been reported. He first oriented the crystals by means of a field created by an old Ford

spark coil. He next worked with a powerful magnet the use of which was allowed him by the authorities of Columbia University. It was at this point that he succeeded in preparing his first permanent sheets. He continued his researches, and at the same time returned to Harvard to complete his studies. He further developed the technique so that the product became commercially possible, and considerably extended the field by the discovery of an easier method for the preparation of the crystals in a state that would allow their use, and by the discovery that Herapathite is but one of a large number of related substances, the alkaloids.[8]

In 1932, Land and Wheelright decided to set themselves up in business. With Wheelright's backing, they founded, in a cellar in Dartmouth Street, Boston, a general laboratory consultant service in physics. Land, still in his twenties, was the researching half of the Land-Wheelright Laboratories; Wheelright, the dynamic salesman of the team, took over the promotional angle of the business. The *Eastman Kodak Company* had been following Land's research and in 1934 became interested enough to sign a contract for the manufacture of photographic light filters called Pola-screens, becoming the first commercial licensee of the new product. On the heels of Eastman came the AMERICAN OPTICAL COMPANY which, through the enterprising salesmanship of the inventor himself, took out a license to manufacture Polaroid for use in sun glasses. BAUSCH AND LOMB OPTICAL COMPANY also took out a license and the new invention was definitely established.

These happy events were, however, accompanied by a number of patent uncertainties. Land, of course, was not the first to polarize light. The idea of polarizing automobile headlights to prevent glare had been suggested after the War by Lieutenant Frank Short, a U. S. Army officer living in England. In 1920 a patent on a method was applied for by Lewis Warrington Chubb, now director of Westinghouse Research Laboratories; and in 1921 Short applied for a patent on the idea. After wrangling for several years over their patents, Chubb and Short made an out-of-court settlement and combined under the name of Polarized Lights, Inc. When Land stepped into this situation, there was further wrangling. Land, whose system contained acknowledged improvements, obtained a patent with limited claims, and his general patent on the polarizing sheet and the manufacturing process stood free and clear. In view of the fact that Land's invention was already in production, Chubb

and Short sold out to Polaroid for a down payment and a stock interest in Polaroid Corporation.[9]

In Land's invention the colloidal particles of Herapathite are produced from the bisulfate of quinine and are dispersed and suspended in nitrocellulose. His process for the manufacture is as follows:

One and one-half grams of quinine bisulfate are dissolved in 50 c.c. of methyl alcohol. The solution is brought to a boil and stirred preferably with an iron stirring rod. The heat is removed from the solution and 0.525 grams of iodine as a 20% solution in alcohol is immediately added. Stirring is continued until a gel has formed and the mass has cooled.[10]

Herapathite crystals commonly occur in two modifications, generally designated alpha and beta varieties. Care should be taken to use only one variety in the suspension, as the geometric disposition of the polarizing axes in the two varieties is different. Crystals of but one variety, however, result from any standard method of preparation.[11]

The suspension is introduced into a protective medium of nitrocellulose, in a complete non-solvent of the colloidal Herapathite, such as amyl acetate, butyl acetate, ethyl acetate, or mixtures thereof. Methyl acetate should be avoided. The nitrated cotton should be suspended in as little solvent as will dissolve it. The highly soluble cottons such as one-half second or one-fourth second cotton, are preferable.

Before the cotton is dissolved in the acetate, it should be dried and freed from water and alcohol. The nitrocellulose solution is highly adhesive; and, when the Herapathite is added, the particles are readily dispersed through the solution and remain dispersed therein and suspended thereby. The fluidity of the suspension may be controlled by the addition or elimination of the solvent, so that an extremely fluid, or hardened and set suspension, may be secured.

Other cellulose materials, for example, cellulose acetate, may be used as the protective medium when dissolved in suitable solvents. Certain gums such as Canada balsam or linseed oil jelly, may be employed. In fact, any material which disperses without dissolving or otherwise destroying the colloid may be used.[12]

A crystal containing the suspension of the proper viscosity can be made in the following manner: Two stock solutions are first prepared: Solution No. 1, consisting of 80% ethyl acetate and 20% butyl acetate;

and solution No. 2, consisting of 420 cubic centimeters of solution No. 1 and containing 100 grams of cellulose nitrate. To 800 cubic centimeters of solution No. 1 is added 300 cubic centimeters of solution No. 2 and 2 grams of Herapathite crystals. This mass is ground by a pebble-grinding machine for a period of from 84 to 96 hours. One hundred cubic centimeters of solution No. 2 is introduced and the grinding continued for another five hours or more. The grinding appears to secure substantially uniform small size and distribution of the crystals. When the grinding is finished, the suspension is treated with a plasticizing agent, such as dibutyl phthalate in camphor, the quantity added being about 30% by weight of the cellulose nitrate. The crystal-forming reaction may also be made to take place with advantage in the suspending medium itself.[13]

The crystals thus dispersed have substantially all orientations of their polarizing axes, and form an opaque mass. To convert this into a transparent polarizing body, it is subjected to a mechanical and electrical force to which it is susceptible.

Magnetic and electric fields of force may be employed to accomplish the orientation. The electromagnets employed, of the open-magnetic circuit type, are adapted to producing an intense field of at least 10,000 gauss. If an electric field of force is employed as an orientating agent, an intense electrostatic field is produced between the plates of an air condenser. This condenser is energized by a high potential alternating current since a direct current would cause migrating of the crystals from one portion of the suspension to another, apparently due to the fact that crystals carry small charges and so act like slow-moving ions. An alternating current of too low frequency should be avoided.[14]

In the methods described, the crystals seem to have a physical property which is susceptible to the field of force applied. When the magnetic field is employed, the crystals appear to move in the suspension so that their axes of maximum permeability (conductivity) lie along the lines of magnetic flux. In like manner, in the electric field the crystals move so that their polarizing axes are substantially aligned. In the case of mechanical force described below, the crystals have a geometrical dimension which is acted upon by the force applied frictionally.

The method, which is simple and economical in its requirements of apparatus and material and which can be conveniently executed, orients the crystals and provides the product in the form of a sheet.

Like slightly darkened celluloid in appearance Polaroid film is a flexible cellulosic sheet, unlimited in area, in which are embedded some thousand billion needle-like crystals per square inch, all lying parallel. It is in this form that it comes out of the processing machine.[16] In order to protect the film from dirt and damage it is always laminated between sheets of glass or heavy photographic safety film.[17] At the present time Polaroid is the only polarizing material that is available in large sizes and quantities.[18]

The individual crystals in the film are exceedingly small, having a longitudinal dimension of 1 to 2 microns, and a girth diameter of 600 micro-microns, considerably less than the wave length of visible light.

The crystals are so small and their concentration so great that the structure of the film is invisible and the appearance is completely homogeneous. Under special conditions of polarized illumination and at magnifications greater than 1100, it is just possible to discern discontinuities in the film, the thickness of which is approximately 0.0026 inch. The film does not deteriorate with time and it readily stands exposure to heat up to 250 degrees F.

A perfect polarizer would transmit fifty per cent of the incident light, but the inevitable reflection losses of the front and back surfaces would immediately reduce this to forty-six per cent. Since the effective average transmission of Polaroid is thirty-seven per cent, the efficiency as a transmitter of polarized light is roughly eighty per cent.

It is important to note that both the transmission and polarizing power of commercial polaroid are nearly constant throughout the central part of the visible spectrum (from 4800 A.U. to 6800 A.U.) In this region the degree of polarization* is greater than 0.996.[19]

For over a century scientists have recognized polarization as a powerful tool for research in all the sciences; a powerful tool, but so costly that few could afford it, and so inconvenient that fewer still had the skill and patience to work with it.

Now Polaroid makes it possible to use polarized light almost as conveniently and inexpensively as ordinary light. The smallest standard Polaroid disc of optic grade has over nine times the area of the largest Nicol prism regularly available and the cost is less than one-seventh as

*The degree of polarization is defined as the ratio of the intensity of the plane polarized part to the intensity of the transmitted light as a whole.

much. Thousands of teachers and research workers are equipped with Polaroid. They are exploring fields of science that have never been entered before; they are demonstrating to their students the classical experiments in the polarization of light perhaps the most brilliant in the world of science.[20]

It has been said that spectacles without which half the world's knowledge would never have been acquired, constitute the greatest single invention of man. It is doubtful whether the polarizing of light will take any such place in history as the focusing of light has taken, nevertheless, it is one more extension of man's power over nature. Professor Robert W. Wood, regarded as the greatest American authority on optics, has said of Polaroid: "It is the most significant invention in the field of optics, certainly within the last generation, probably in the last century."[21]

Polaroid has been on the market only three years, yet its use is growing so fast that the company has difficulty in keeping up with the demand. Piled up in the Polaroid laboratories are literally dozens of applications of its principles, and of these the sales department is now actively handling more than thirty. Twenty-five other uses are still in the experimental stage, most of them almost ready for commercial application.[22]

Polaroid is important because it controls one of the two basic properties that distinguish light from other forms of energy. One of these is color, determined by the frequency of the light vibration. Controllable since the earliest times, color is the basic of many industries, has importance for almost all. The other property is vibration—direction, determined by the direction of the transverse light vibrations with respect to the path of the light beam. Except in the exceptionally well equipped physics laboratory, this property has never been controllable. Potentially, equal or superior in usefulness to color, the phenomenon of polarized light, hitherto little more than a scientific curiosity, will presently become a commonplace of daily experience.[23]

To estimate the significance of fundamentally new products requires a vigorous and deliberate effort of the imagination. When Hall succeeded in making the rare metal aluminum commercially available, no one could guess that he was making airplanes practical, just as no one was able to foresee the scope of bakelite. The invention of Polaroid opens an entirely new field of applied optics whose general importance may ultimately be

comparable to the developments which the invention of the vacuum tube has wrought in applied electricity.

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Current Comments by Carel C. Koch

Editor, American Journal of Optometry

Optometrists will confer a favor by sending for this department items of news of general interest; such as relate to new instruments, clinical techniques, education, public health and optometric legislation.

A NON-CYCLOPLEGIC METHOD OF FUNDUS PHOTOGRAPHY

In October of last year, there was described in this department,[1] a clinical eye camera devised so as to enable optometrists to photograph the external appendages of the eye. This camera is constructed to take life size photographs of the eye and lid in either full color or in black and white. About the same time, at the Ohio State University at Columbus, Ohio, Kathryn Louise Stone of the College of Optometry, and M. L. Pool of the Department of Physics were completing and publishing a report,[2] of some original experimental work done in the field of fundus photography of the interior of the living eye, without the use of cycloplegics.

Fundus photography has been successfully accomplished for some years but the work of Stone and Pool bring this aid to diagnosis a step nearer clinical perfection by enabling the technique to be used without resorting to the use of a cycloplegic. In the past, when photographing the living fundus it has been necessary to instill a cycloplegic into the eye under observation. The purpose of this was to keep the pupil from contracting under the high illumination levels required to successfully photograph the fundus. With the new photographic equipment assembled at Ohio State University, this obvious disadvantage of having to use a cycloplegic is eliminated and the photographs of the fundus can be made without resorting to the use of drugs.

The optical arrangement of this new photographic system, as assembled by Stone and Pool, is as follows. As a primary source of light the new high intensity type H6 1000-watt water cooled mercury arc

1. Carel C. Koch. Clinical Eye Camera. American Journal of Optometry, Vol. 16, No. 10, page 384, 1939.
2. Kathryn L. Stone and M. L. Pool. Fundus Photography without Cycloplegics. Journal of the Optical Society of America. Vol. 29, No. 11, pages 463-465 (Ill.), 1939.

lamp was used. Light from this source is passed through a convex lens, with a focal length of 35 mm, onto a variable slit. The light first passes through the slit, then through a shutter and into a second convex lens with a focal length of 60 mm. This second lens is so arranged as to focus the light, with the assistance of mirrors, at the pupil. This light source and focusing system is used to illuminate the fundus. The first polarizing agent and special light filter are placed between the second convex lens and the eye.

A second light source is arranged, also with the aid of mirrors, at such a position so that the image produced by the second convex lens is also at the pupil of the eye under observation. When photographs are made, this second source of light is used as a very weak ocular fixation object by the patient, prior to bringing into focus the primary source of light.

The divergent reflected rays of light which emerge from the interior of the eye then pass through the lens of the camera where they are brought to a proper focus. The experimenters point out that this camera lens should have a large aperture in order to be able to receive light from widely separated portions of the fundus. It should also have a focal length as short as possible in order to reduce the size of the image and thus increase the speed of the camera. The following lenses have been used with success in this camera: *f*:1.8, with a focal length of 75 mm.; *f*:1.5, with a focal length of 50 mm., and *f*:1.3, with a focal length of 25 mm.

The second polarizing agent is placed within the camera immediately behind the lens. The first and second of these polaroid lenses are used in the following manner. The first polaroid lens is rotated in such a way that the light from the slit is polarized in a perpendicular plane. Light reflected from the cornea remains, for the most part, polarized and that reflected from the fundus is depolarized. Since the intensity of the light reflected from the cornea is comparable to that from the fundus, it is therefore necessary to rotate the second polaroid lens in such a way as to cut out all light polarized in the original plane. By using this technique, only depolarized radiation from the fundus gets through the second polaroid lens and onto the photographic film.

A third light source, equal to the second minor fixation light is introduced to enable the eye not under observation to relax and view, with the aid of a convex lens the virtual image of this third fixation lamp.

Stone and Pool found that the contrast on the photographic film between the arteries and veins and the surrounding fundus tissues of the eye is photographed to best advantage with green illumination. The suggested H6 arc lamp used, emits a large per cent of its total radiation in the yellow green line at about 5461 A.U. Other principal lines of visible radiation, however, emitted by this lamp, and mainly those at 4358 A.U., 4047 A.U., and 3660 A.U., should not be allowed to enter the eye and must be removed, for proper photography, by the special filter placed with the first polaroid lens. The Jena filter GG11 or the Wratten filters K-2, G or the monochromatic No. 77 have been found about equally satisfactory. The circulating water, used in cooling the lamp, absorbs about 90 per cent of the infra-red radiation.

The new commercial Eastman Tri-X pan-chromatic film was found to be successful for this type of fundus photography. This film has a Weston rating of 140 when developed in a DK 60a.

In doing the non-cycloplegic type of fundus photography the patient, as well as the complete apparatus, should be housed in a darkened booth or a room from which nearly all light can be excluded. Using these suggested techniques, the procedure is to first close the shutter and then to turn on the second light source. The eye to be photographed then sees a faint general red glow when the adjustments are correct. Stone and Pool point out that the only purpose of this weak light source is to give the patient a visual fixation object during the period in which he is becoming dark adapted.

Should the very strong light from the primary light source be admitted through the shutter for the purpose of making the preliminary adjustments, the patient's iris would contract to such size that fundus photography would be impossible. The secondary light source is therefore used during this preliminary period while the apparatus is placed into position. During this same period the patient's pupil remains normal in size.

Since the amount of light from the second light source is very weak, the amount being just adequate to give the patient a sensation of light, the amount of light reflected back from this faintly illuminated fundus and onto the photographic film is indeed very feeble. Consequently, it is not necessary to use a shutter on the camera itself.

Using these suggested techniques, the eye not under observation is relaxed and sees at infinity, the virtual image of the third light source.

Since the eye under observation is also relaxed, it is now only necessary to set the camera unit to focus parallel rays of light in order to get a sharp image of the fundus on the photographic film. When these preliminary adjustments have been made, the shutter is opened for a predetermined period of time to allow the light from the very strong primary light source to illuminate the fundus. Using the lamp suggested, the shutter is opened for about 1/10 second. In this manner are these non-cycloplegic fundus pictures made. The technique has been used sufficiently to prove its worth and the resultant fundus pictures compare very favorably, indeed, with the best fundus pictures taken heretofore using other techniques.

Stone and Pool have performed a singularly sound and useful piece of experimental research. The experiments and studies of many optometrists and educators have gone into the exacting development of scientific refractive techniques which enable patients to be properly refracted without the aid of cycloplegics. Improved instrumentation has brought the diagnostic techniques of ophthalmoscopy to such a high plane that it is no longer necessary to think of using a mydriatic to examine the interior of the eye. The development of the plastic contact lens has eliminated the need for an anesthetic in fitting these aids to sub-normal vision. And now these workers at the Ohio State University have overcome the last citadel of those who still advocate the use of cycloplegics in eye work, by developing a useful clinical technique which permits the living fundus to be photographed at will, for diagnostic purposes without resorting to the use of drugs.

A. O. A. ANNUAL CONGRESS

An announcement has been received from Dr. F. J. Klein of Cincinnati, Ohio, in which the dates are given for the coming meeting of the American Optometric Association in that city. The annual sessions will be held June 23rd to June 27th and an extensive convention committee has been appointed to arrange the convention details covering both educational activities and entertainment. Dr. Klein is treasurer of the 1940 A. O. A. Congress Committee of the Ohio State Optometric Association and Publicity Director for this annual meeting of A. O. A. affiliates. All members of this important association are urged to attend this event as many matters directly affecting the well being of optometry will be before the delegates.

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A REVIEW OF CERTAIN OCULAR CASES IN WHICH SUB-NORMAL VISION WAS IMPROVED*

The term sub-normal vision, as used by optometrists and oculists refers only to those cases, whose visual acuity cannot be materially improved by the employment of ordinary visual aids, such as ophthalmic lenses and certain forms of orthoptic treatment. Many patients, when without their glasses have a visual acuity of somewhat less than normal, yet in most of these cases, vision is returned to normal, or at least to a very high degree of visual efficiency, by the use of various types of ocular corrections made up in spectacle or eye-glass forms. These latter patients, whose visual acuity is returned to normal by means of ordinary ocular corrections, are never referred to as patients whose visual prob-

*The eighth of a series of nine papers by Carel C. Koch, Opt.D., F.A.A.O., dealing with reported clinical findings. The concluding paper of this series will appear in the April, 1940 issue of the AMERICAN JOURNAL OF OPTOMETRY.

lems are such as to include them in that group, who really suffer from sub-normal vision.

On the other hand, the true case of sub-normal vision is one who fails to get relief with these customary visual aids, and in these special cases more vigorous and complicated corrective procedures must be employed to bring vision to some useful level. These special corrective aids may embody the use of very high power, single focus lenses, or multifocal lenses of considerable strength, or a series of lens systems, as is arranged in the telescopic spectacle and the microscopic spectacle. These corrective aids may also take the form of specially made contact lenses, or may embody the use of a number of specialized forms of orthoptic treatment techniques. Stenopaic slit glasses as well as the pin-hole spectacle are also employed for cases which fall in this category, as well as the ptosis spectacle, which definitely plays a part in relieving sub-normal vision in certain cases in which the eye-lids are also involved.

In reviewing the portion of ocular literature which deals with cases of sub-normal vision due to unreported causes, one finds but relatively few case reports presented. This is quite natural, inasmuch as sub-normal vision, as such, is the end result of some physical or ocular abnormality which, as a rule, can be determined from the case history as well as from the external examination of the eye, or from the ophthalmoscopic examination. Most of the many reported cases dealing with sub-normal vision include a diagnosis of its cause, made prior to engaging in the necessary visual rehabilitation measures. These cases are, in part, reported elsewhere in this series of papers, and in this report will be found only those cases summarized, in which the cause of the abnormality is, for the most part, unreported.

In this series of papers dealing with clinical case reports, a number of cases of sub-normal vision have already been mentioned. These findings were, in every instance, clinical reviews in which the author had reported the underlying cause of the sub-normal or very materially reduced vision. Cases of sub-normal vision were, for instance, included in that group of reported cases which had for their basic cause, general pathology.[1] Cases of sub-normal vision were also included in that paper which dealt with ocular abnormalities due to involvements of the extra

1. Carel C. Koch. A review of certain cases of ocular abnormalities in which general pathology was a factor. American Journal of Optometry. Vol. 16, No. 12, pp. 457-469. 1939.

ocular muscles,[2] and later those cases due to ocular injuries.[3] In the final paper of this series, a number of case reports having to do with the correction of sub-normal vision will also be presented. In these cases, the after effects of specific ocular pathology is, in each case the reported cause of the sub-normal vision.

In the clinical case reviews presented in this paper, however, the underlying cause of the sub-normal vision is unreported. The cases are presented simply as case reports, in which, each patient was handicapped by materially reduced vision and certain corrective steps were taken by various optometrists to give these patients whatever visual assistance could be rendered.

These cases of sub-normal vision of unreported causes, are all from clinical reviews in which the patient was first reported as being under the care of some oculist, who failed to give the patient the exact type of necessary visual care, needed to improve vision to that point, wherein the patient would have some degree of visual comfort and efficiency. These cases then turned to optometrists, who because of their superior training in the intricate handling of visual problem cases were able, in some measure at least, to assist these patients and thus return to them, a degree of useful vision.

It is natural that these patients found the services of optometrists of value to them. The reasons for this are, that the full and complete training of the undergraduate optometrist is centered around the correction of visual defects and the optometrist in practice devotes his entire energies to problems which closely relate to the correction of sub-normal vision. On the other hand, oculists have, generally speaking, but a meagre background of eye training in comparison to that given the optometrist. In addition, their work calls for a division of their interests and energies throughout the entire field of surgery and therapeutics of the eye, ear, nose and throat, leaving them but little time for the specialized refractive care of these involved and highly technical sub-normal vision cases.

The clinical case reports which are now presented, are all taken from recognized sources of technical literature. All reports were originally written by competent eye specialists during comparatively recent periods.

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2. Carel C. Koch. A review of certain ocular cases in which strabismus was corrected by means of lenses, prisms and orthoptic treatments. American Journal of Optometry. Vol. 17, No. 2, pp. 72-82. 1940.

3. Carel C. Koch. A review of certain cases of ocular abnormality in which injury was a factor. American Journal of Optometry. Vol. 17, No. 3, pp. 118-127. 1940.

These reports have been rewritten by the author, but the salient facts of each report have been retained. These case reports indicate, as much as clinical reports can indicate anything, the high degree of technical skill shown by optometrists in assisting these problem cases.

Case Report No. 113

Jaeckle reports the following case in the AMERICAN JOURNAL OF OPTOMETRY, Vol. 13, No. 12, p. 458. Patient, female, age 45. Has suffered from sub-normal vision during the past six years. Can read newspaper headlines and gets about alone but can do no real near-point work. Has consulted several oculists without appreciable relief. The optometrist Jaeckle examined this case and with the aid of telescopic spectacles enabled her to read with comfort and also enabled her to enjoy 10/40 distance vision.

Case Report No. 114

Jones reports the following case in the AMERICAN JOURNAL OF OPTOMETRY, Vol. 11, No. 2, pp. 70-71. Patient, girl, age 13, had been examined at a school clinic. The oculist in charge had informed her that she was blind in her right eye and that she was partially blind in the left eye. To save the remaining sight of the left eye she was enrolled in a sight saving class. The oculist prescribed the following correction for this patient:

O.D. Plano.
O.S. —0.50 D.Sph.

While attending the sight saving class her parents consulted the optometrist Jones, who prescribed orthoptic treatment for the child's left eye. Four months later the vision in the left eye was 20/20 or normal, and the glasses were discarded. The patient was transferred back to her regular class at school.

Case Report No. 115

Jaeckle reports the following case in the AMERICAN JOURNAL OF OPTOMETRY, Vol. 13, No. 12, p. 458. Patient, male, age 21. Suffered from sub-normal vision for the past 10 years. He has had repeated medical consultations with oculists but no treatment. He could get about alone and read newspaper headlines. The optometrist Jaeckle examined him and found his uncorrected visual acuity to be as follows: O.D. 5/200. O.S. 10/200. For a nine month period visual training and rehabilitation were prescribed. Then a cylindrical correction was prescribed for

general wear, this supplemented by means of a telescopic spectacle for special distance vision with reading additions which enabled the patient to easily read regular newspaper print. His corrected distance visual acuity is O.D. 10/100. O.S. 10/77.

Case Report No. 116

Hunt reports the following case in the REFRACTIONIST, Vol. 28, No. 496, p. 106. Patient, age 75, blind in the left eye and with just light and dark perception in the right eye. Patient had been examined by various oculists and had several sets of glasses as well as a pair of Zeiss Telescopic Spectacles which she could not use. She was hopeful that something could be done to enable her to read. The optometrist Hunt after a prolonged examination prescribed the following correction:

O.D. +14.00 D.Sph.

This lens was mounted in a special frame which placed the lens 1½ inches before her eye. With this in place she could read newsprint with the aid of a good light and a red place marker to help her follow the lines.

Case Report No. 117

Jaeckle reports the following case in the AMERICAN JOURNAL OF OPTOMETRY, Vol. 13, No. 12, p. 462. Patient, female, age 37. Has suffered from sub-normal vision for the past 30 years. She goes about alone with great difficulty. Can read a newspaper by holding it 1½ inches from her eye. Attended school until the 7th grade, although she had to leave her seat to see anything on the blackboard. Patient has been wearing glasses since she was 23. Her present correction which helps her but little, and which was prescribed by an oculist, was as follows:

O.D. —9.00 D.Sph.
O.S. —9.00 D.Sph.

The optometrist Jaeckle examined the patient and found the cornea to be dull and hazy, posterior synechiae and a general involvement of the crystalline lens. The following corrections were prescribed for the right eye, which enabled the patient to get about with ease and read with comfort:

O.D. —30.00 D.Sph.

This distance correction was prescribed in myodisc form with a 20 mm. center, decentered 2 mm. down. For reading the patient was given for

the right eye a telescopic spectacle—Wide Angle—1.7. Her corrected distance visual acuity was 10/68.

Case Report No. 118

Blaine reports the following case in the NORTHWEST JOURNAL OF OPTOMETRY, Vol. 2, No. 2, pp. 41-42. Patient, female, age 71, had been previously informed by an oculist that she was blind in her right eye. He had prescribed a correction for her left eye which she had used, but she was very disappointed with the diagnosis made regarding the right eye. The correction prescribed by the oculist was as follows:

O.D. —5.00 D.Sph.
O.S. —5.00 D.Sph.

The optometrist Blaine re-examined her and gave her the following prescription which enabled her to enjoy 20/30 vision in each eye, with complete comfort:

O.D. —12.00 D.Sph. ⌒ —3.00 D.Cyl. axis 90.
O.S. — 5.50 D.Sph. ⌒ —0.50 D.Cyl. axis 90.

Case Report No. 119

Jaeckle reports the following case in the AMERICAN JOURNAL OF OPTOMETRY, Vol. 13, No. 7, pp. 266-272. Patient, male, age 78. Patient complains of very poor vision, and glasses do not seem to improve this. He had been under the care of an oculist, who had administered local medical treatment for six months without results. His visual acuity, corrected or uncorrected was O.D. 6/200. O.S. 6/200. O.U. 6/200. An examination of the patient by the optometrist Jaeckle indicated a binocular involvement of the lens. A period of visual training was started and with the aid of microscopic spectacles the patient was able to read with ease.

Case Report No. 120

Arneson reports the following case in THE NEW OPTOMETRY 1932 p. 157. Patient, boy, age 14. Suffering from very poor vision in the right eye. He was wearing the following correction which an oculist had prescribed and which gave him the following visual acuity. O.D. 1/10. O.S. 20/30.

O.D. +1.50 D.Cyl. axis 120.
O.S. +0.25 D.Sph.

The optometrist Arneson prescribed orthoptic treatments and a slight

change in the correction and vision improved to the following: O.D. 6/10. O.S. 20/20.

Case Report No. 121

Jaeckle reports the following case in the AMERICAN JOURNAL OF OPTOMETRY, Vol. 13, No. 12, pp. 460-461. Patient, male, age 77. Patient under care of oculist for last two years. Six months ago had been told that nothing more could be done for him. His distance vision was very poor and he could not read. He consulted the optometrist Jaeckle to get help for reading if possible. A telescopic spectacle enabled him to read with ease.

Case Report No. 122

Hunt reports the following case in the REFRACTIONIST, Vol. 28, No. 496, p. 104. Patient, female, who had been very myopic for years. She was wearing the following correction which had been prescribed by an oculist, and she wanted to see better if possible. Her corrected visual acuity with her glasses in place was 1/60. The correction was:

O.D. —23.00 D.Sph. ⌒ —5.00 D.Cyl. axis 90.
O.S. —23.00 D.Sph. ⌒ —5.00 D.Cyl. axis 90.

The optometrist Hunt examined the case and prescribed the following correction which improved vision to 2/12.

O.D. —25.00 D.Sph. ⌒ —7.00 D.Cyl. axis 95.
O.S. —25.00 D.Sph. ⌒ —7.00 D.Cyl. axis 90.

Case Report No. 123

Jaeckle reports the following case in the AMERICAN JOURNAL OF OPTOMETRY, Vol. 13, No. 12, p. 460. Patient, male, age 55. Had suffered from sub-normal vision for the past 50 years. His vision is so sub-normal that he conducts his shade and awning business by touch. Has never been able to read but knows alphabet and figures. Has had a number of oculists examine him with no results. He consulted the optometrist Jaeckle in the effort to get some correction which would enable him to see near objects with some degree of clearness. His uncorrected visual acuity for distance was O.D., H.M., O.S. 4/200. Visual training was prescribed for a two week period and then a microscopic spectacle was ordered which materially improved his near-point vision.

Summary

The clinical case reports presented in this paper are of cases in

which the patient had little or no useful vision. From the economic viewpoint, these patients were for the most part industrially blind and in some instances were, to all intents and purposes, without sufficient vision to enable them to carry on the ordinary activities of life. These cases were all under the care of oculists, who had either informed the patient that nothing additional could be done to improve the existing ocular condition, or else had prescribed treatments or ocular corrections which in no material way improved the sub-normal visual acuity which was present. These cases then consulted optometrists, who were able to sufficiently improve vision to enable these patients to successfully carry out some normal and useful functions.

Conclusions

Because of their superior technical training in ocular matters and because their entire professional activity is devoted to the art and science of ocular refraction and the improvement of vision by various means, optometrists are the one professional group to whom should be allocated the intricate problems which arise in the correction of sub-normal vision.

CAREL C. KOCH

PROCEDURE AND INSTRUMENTATION

By Guy L. DuPlessis

A department wherein discussions will be carried on relative to the value of various experimental and clinical techniques as employed by practicing optometrists, and also in which the instruments used by optometrists in various phases of their work, will be subjected to some critical evaluation.

THE HIGLEY DEPTHOSCOPE

This instrument manufactured by *Bausch and Lomb Optical Company,* is essentially similar to Cantonnet's rod device as developed from Hering's "drop test" for the determination of depth perception. It consists of a box on a stand, illuminated from within. At one end the subject's head is firmly positioned against a rest. A septum can be used to occlude one eye or the other, or both eyes left uncovered.

The instrument has no ocular system and the eyes of the subject look as naturally as in an inclosure. Five hundred millimeters from subject's eyes are four characters of varying size, characters suited for children and illiterates. These characters are controlled by rods protruding from the rear of the instrument. These rods are graduated in millimeters. The criterion of depth perception is the parallactic displacement of any two objects occasioned by their sagittal displacement and as seen binocularly. According to the optometrist Higley, who is the inventor, a parallactic displacement of 60 seconds may be considered normal. As this parallactic displacement varies proportionately to pupillary distance for a given separation of objects, it is therefore necessary to refer to tables.

As the rods are graduated in millimeters instead of parallactic angle, the depth perception can be estimated in millimeters separation between any two figures, thus obviating the use of tables or of complicated formulation. A separation of 1 mm. between figures corresponds approximately to a parallactic angle of 54 seconds for a pupillary distance of 64 mm.

The inventor suggests use of the Depthoscope to train and develop judgment of depth, by first showing to the patient, through an aperture at the top of the instrument, the relative separation of two figures, then having him bring them together to an apparent level. Repetition of this procedure is said to develop a better interpretation of the parallax and thereby of depth. While this instrument was primarily designed for the corrective training of heterotropias, it is also suitable for measurement of the depth perception in visual survey work. The question remaining is, whether its design, suitable as it is for office use, is adequate for speed of operation such as is necessary in rapid survey work. This should be determined by trial on large groups of people.

GLAZER ON THE CAUSE OF PRIMARY GLAUCOMA

The difficulty of accepting a theory on the causation of glaucoma is well illustrated by Parson's aphorism: "Glaucoma is a symptomatic condition, not a disease *sui generis.*"

Its chief physical sign is increased intra-ocular pressure. Parson differentiates between pathologic and non-pathologic increases in tension. Pathologic tension he divides into those showing some increase, more or

less ciliary inflammation and an anterior chamber of normal depth, and those showing all degrees of intra-ocular pressure, no ciliary inflammation and a shallow chamber.

Glaucoma is again divided into primary or idiopathic glaucoma and secondary glaucoma. Secondary glaucoma is said to be due to an obstruction of the filtration angle of the anterior chamber and observable especially with the Troncoso gonioscope. Primary glaucoma is of unknown cause and is the type of glaucoma under discussion. All that is known is that certain clinical signs are observed predicating that condition. Not all signs are seen in each case or at one time. The obviousness of the prodromal symptoms lead to the conclusion of glaucoma.

Here is a brief review of symptoms. (1). Increased intra-ocular pressure. It is to be noted that tonometry does not measure the true intra-ocular pressure, but is merely an approximation. It is more exactly a measure of the resistance of the sclerotic in the living eye to deformation by a weight. Its value lies in comparative measurements in two eyes on the same day or in one eye of the same person on different days. (2). Constriction of the visual field, particularly in the nasal quadrant (Rohne Step), often preceded by a sickle shape extension of the blind spot (Seidel's sign). (3). Lowered visual acuity. This may not be observed until late in the development of various other signs. (4). Shallow anterior chamber. (5). Cupping of the optic disc. Not a physiologic depression, but an underlapping of the optic disc accompanied by pulsating artery as it courses over the shoulder of the cup. This pulsating, if not evident, can be induced by pressure on the globe. Not to be confused with venous pulse induced by finger pressure. (6). Edema of cornea (bluish haziness). (7). A small cornea. (8). Hyperopia being as well as age a predisposing factor, invites suspicion. (9). Momentary obscurations of vision. (10). Colored halo (not to be confused with physiologic halos due to diffraction). (11). Interciliary or ciliary staphyloma and equatorial staphyloma in old cases. (12). Conjunctival chemosis. (13). Retinal disadaptation. (14). Dilated and rigid pupil. (15). Sudden increase in presbyopia. (16). Thinning of retinal vessels. (17). Loss of sensitivity of cornea. (18). Pupillary reaction to light and accommodation defective.

These symptoms are seldom all present at the same time, but they have all been observed in cases diagnosed as glaucoma. A theory of glaucoma while it may fall short of its goal must comply with at least most of the observable symptoms. It must also comply with other observa-

tions of time, age, pain, refractive changes, etc., not necessarily diagnostic but related to the subject.

Recently two theories of glaucoma have been offered by optometrists in these pages. The first by Saks,[1] [2] offered as an optometric mean of controlling glaucoma, is based on the belief that dark adaptation, through some unknown mechanism, perhaps the oculo-cardiac reflex, causes an increase in tension resulting in symptoms known as glaucoma. This theory may be tenable in explaining the greater incidence of hypertension during sleep, yet it is unsatisfying as a complete explanation of glaucoma.

The other by Glazer,[3] that the extra-ocular muscles by reason of their tonus produce a traction of the eye backward against a yielding mass of fatty tissue. When the yielding limit has been reached, this force is translated as an increase in intra-ocular tension.

Herewith is a communication by Dr. W. H. Glazer that gave rise to the answer immediately following.

"The normal intra-ocular pressure range is described as 15 to 25 millimeters of mercury. An inch of mercury has a pressure of 0.4912 pounds per square inch. The normal pressure is then approximately 0.3 to 0.5 pounds per square inch.

"Assuming the papilla as an ellipse, with axis (2a) 2.38 millimeters, and axis (2b) 1.75 millimeters, the papillary area resolves itself into an area of about 3.75 square millimeters. Since a square inch is equivalent to about 625 square millimeters, the normal total pressure on the papilla is from 1/625 pounds to 2/625 pounds.

"Now let me assume a glaucomatous pressure is as much as double the normal (diastolic) maximum, sufficient to collapse the vessels. I have nowhere seen it stated in terms of millimeters of mercury. In terms of the above figures, it seems utterly beyond imagination that such a relatively small force over the entire area of the papilla could possibly cause the characteristic glaucomatous depression of the disc. I believe my figures are correct and I am inclined to think that we have evidence that throws

[1]Charles I. Saks. The Control of Primary Glaucoma by Optometric Means. American Journal of Optometry. Vol. 15, No. 11, pp. 412-418.
[2]Charles I. Saks. An Optometric Means for the Control of Primary Glaucoma. American Journal of Optometry. Vol. 16, No. 7, pp. 241-269.
[3]W. H. Glazer. Glaucoma, a Theory of Cause. American Journal of Optometry. Vol. 16, No. 6, pp. 222-230.

considerable doubt on the theory that an increase in the intra-ocular pressure will cause a cupping of the disc. I would appreciate a discussion of this matter."

This letter presents an interesting problem. It has, however, one shortcoming. It fails to offer a new theory of cause for glaucomatous cupping. Assuming that the figures presented are correct, we are still confronted with the fact that cupping occurs in some advanced cases of glaucoma. Let us see in what way this optometrist's premises may be faulty.

He claims that the normal intra-ocular pressure range is described as 15 to 25 millimeters of mercury. If, by that, is meant the resistance of the cornea to a known weight, we might question this statement on the grounds that the cornea has a structural resistance of its own which may be equivalent to 15 to 25 millimeters of mercury if the cornea were a perfect elastic substance. In other words, if the intra-ocular pressure is equal or slightly above atmospheric pressure, the substance of the cornea itself will resist indentation by a tonometer. This pressure would therefore not be a true intra-ocular pressure, but would be that of elasticity of the cornea plus intra-ocular pressure.

He also claims that the normal pressure is approximately 0.3 to 0.5 pounds per square inch. If this is correct, that pressure is not inconsiderable and as fluids are incompressible except at relatively high pressure, the increase in volume of liquid in the eye due to stoppage of Schelm's canal is bound to result in a distention and increase in size of the containing vessel, namely, the eye. This distinctive force is exerted equally in all directions, but the greatest distention will take place in the structurally weakest part of the eye. The optic nerve being the cross section of a bulkier body may not suffer such distention as the eye proper. However, the area immediately adjacent to the nerve may be structurally weaker than other parts of the eyes, possibly because the choroid ends at this point. Considering the principle in physics of the hydraulic ram, we may speculate that the lymphatic pressure supplying the aqueous is equivalent to a force P on a plunger of a small area a. The pressure is therefore P/a. Now, if a is equal to the area of a cross section of the ram, in this case the diameter of the eyeball, the force exerted outward from the center of the eye is:

$$W = AP/a.$$

We thus see that a small vascular pressure can cause a considerable increase of intra-ocular pressure because the fluids of the eye are incom-

pressible. This pressure is relieved by greater distention at the disc because of relative structural weakness. This pressure may not be registered properly by a tonometer, because of the comparative rigidity of the cornea.

Glazer also claims that the pressure on the papilla is from 1/625 to 2/625 pounds. Reducing the normal pressure from 0.5 pounds per square inch to 2/625 pounds on the papilla itself because of its area, does not reduce the actual pressure which is exerted. It is still 0.5 pounds per square inch. This is merely a translation of the structural weakness of the papilla and a pressure above 0.5 pounds per square inch may cause distention in human tissue. The same pressure confined in an iron ball would be infinitesimal in proportion to the iron's resistance to stretch, but human tissue is elastic and it is not inconceivable that a pressure of from one to two pounds per square inch may cause a distention of the lamina cribrosa, thus pushing the optic nerve back and causing a cupping of the disc.

It appears therefore that even such a relatively small force could cause a depression of the disc as seen in glaucoma, and for the want of a more plausible theory we will have to adhere, in part at least, to the belief that this small force of 0.5 to 2 pounds per square inch is the cause of the distention of the globe of the eye, particularly at the disc in these cases. On the other hand, Glazer offsets this to some degree by the following, which is a quotation from a later communication dealing with this same subject.

"Now, it may be assumed that a glaucomatous pressure is two or three times the normal maximum, sufficient to collapse the arteries. The ounce pressure on a few millimeters of surface at the papilla seems so relatively small as to make it utterly beyond the imagination that the characteristic glaucomatous cupping of the disc could arise from it.

"On the other hand, an indeterminate, yet small force, acting externally against a spherical segment, can then, and then only, become actually significant as a destructive force. And that force, as I see it, can only be set in motion by a simultaneous bilateral traction of the extrinsic muscles, and a rise in barometric pressure.

"That barometric pressure will have its due recognition is apparent to me. I know of the wife of a prominent Philadelphia physician, now under the care of a New York City glaucoma expert, who is receiving the benefit of that consideration.

"I am cognizant of the fact that the work done by any individual

muscle in rotating the eye is amazingly small. But this in no way interprets the working power of a muscle at anywhere near its full capacity against resistance. Something of that power may be sensed by applying a finger with considerable force against the eye. It is of incidental interest that the velocity of the rotating eye is something like six feet per minute, rather disillusioning."

Glazer, in stressing his theory of the cause of glaucoma, as the simultaneous bilateral traction on the part of the extrinsic ocular muscles against the non-yielding envelope of the eye, also points out that if a uniform volumetric increase occurred in these cases, why are not most of them also cases of progressive myopia, or at least cases which in part resemble this condition. It is a generally accepted fact that such is not the case, as many cases of glaucoma are known to require an increase of the convex components of their refractive corrections.

The following records are submitted by Glazer to illustrate this point. These are from a case kept under his observation until blindness ensued.

"Patient Mr. J. C. When first seen, he was wearing the following correction:

September 27, 1924	R. + 6.50 D.S.	
	L. + 6.00 D.S.	Add 2.00

Ophthalmometer Readings

September 27, 1924	R.	40-46.75	L.	145-47.00
		130-45.00		55-45.00
December 28, 1928	R.	40-47.00	L.	145-47.50
		130-44.50		55-45.50
August 20, 1929	R.	40-46.50	L.	145-47.50
		130-44.50		55-45.50

Dynamic Readings

September 27, 1924	R. +13.00 ⌒ —1.75 ax 130	
	L. +13.00 ⌒ —2.00 ax 55	
December 28, 1928	R. +13.00 ⌒ +2.00 ax 130	
	L. +12.00 ⌒ —1.50 ax 55	
August 20, 1929	R. +14.00 ⌒ —1.50 ax 130	
	L. +14.00 ⌒ —1.75 ax 55	

Static Readings

September 27, 1924	R. +11.00 ⌒ —1.75 ax 130	
	L. +11.00 ⌒ —2.00 ax 55	

December 28, 1928	R.	+10.50 ⌒ —2.00 ax 130
	L.	+10.00 ⌒ —1.50 ax 55
August 20, 1929	R.	+10.50 ⌒ —1.50 ax 130
	L.	+10.50 ⌒ —1.75 ax 55

Subjective Readings

September 27, 1924	R.	+11.00 ⌒ —1.75 ax 130
	L.	+11.00 ⌒ —2.00 ax 55
December 28, 1928	R.	+10.50 ⌒ —2.00 ax 130
	L.	+10.00 ⌒ —1.50 ax 55
August 29, 1929	R.	+10.50 ⌒ —1.50 ax 130
	L.	+10.50 ⌒ —1.75 ax 55

Muscles

September 27, 1924	12 degrees esophoria—no vertical.
December 28, 1928	6 degrees esophoria—¾ vertical.
August 29, 1929	13 degrees esophoria—1 vertical.

"On October 23, 1933, the patient required the following correction which was given him after consultation with an oculist of Philadelphia.

R. +8.00 ⌒ —1.50 ax 145.
L. +9.50 ⌒ +2.00 ax 45.
Add O.U. +2.50.

"The following letter, in answer to my query, was written by Mrs. C. Letter dated June 28, 1939.

> "My sister called me this afternoon and told me you would like to know when John was operated on. His first operation was on April 26th, 1934—that was his right eye—then again on the left eye the same date and month in 1935 and again on the left eye six days later, May the 2nd."

"If one assumes that the original prescription worn prior to Sept., 1927, was a true picture of the eyes unaffected, obviously there was a *shortening* of the axes. That an oblique astigmatism in both eyes at this date was a new element induced at presbyopic age is also reasonable to infer, due to muscular traction; hardly due to any volumetric increase. The high degree of esophoria, and its sharp change in 1928, is rather interesting, if not significant, that a change in innervation had occurred; and with it a reduction in the skiascopic report of the left eye, at least. The final correction shows a continuing reduction in power, and an elongation of the axes, with little effect on the astigmatic interval. A

close study of the ophthalmometric readings shows no corresponding, pronounced change in the shape of the eyeball that any volumetric increase should require."

The case report offered by Glazer as evidence of shortening of the eyeball as apparently demonstrated by the increased hyperopia is not necessarily conclusive. No equivalent alterations are demonstrable by the ophthalmometer during the course of the glaucoma. This increase in the hyperopia could be explained by vitreous pressure pushing the lens forward (iris bombeé) or by increase of colloid contents of vitreous producing an increase in refractive index. As a summation of the whole discussion and before leaving the reader to his own conclusions, I here offer Duke Elder's[4] comments on glaucoma. " . . . Each one of these factors has been seized upon by some individual investigator, and has been saddled with the onus of being the cause of glaucoma generally. At one time it has been the capillary circulation, at another venous congestion, or the endocrine glands, or osmotic pressure, or changes in the vitreous, or changes of one kind or another at the filtration angle, and so on. The adoption of such a position is quite unphilosophical, and implies shutting one's eyes to the composite nature of the problem. Further, in these preceding remarks, glaucoma is regarded as a pressure symptom merely. In all probability it is much more, but, in the present state of our knowledge, to treat it as such seems the only course to pursue. For example, the same or parallel physico-chemical processes which produce changes in the physical equilibrium of the vitreous and lens may as well, and as reasonably, derange the still more complex physico-chemical basis of the mechanism which converts radiant energy into nerve impulses in the retina, and which mediates the functional activity of nerve fibres in the retina and optic nerve. A series of cases like those reported by Pickard (1925), wherein a cupping of the disc resembling cavernous optic atrophy was accompanied by symptoms akin to glaucoma without detectable rise in the intra-ocular pressure, is difficult to explain on the orthodox lines. Experimental evidence also (Samojloff, 1923; Wegner, 1925) seems to suggest that the formation and development of scotomata are not entirely dependent upon pressure, but in some cases, at least, are due to changes in the fluid traffic of the retina; and clinically the progress of the symptoms does not run by any means parallel with the tension, and frequently continues after its efficient relief."

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[4]W. Stewart Duke-Elder. Recent Advances in Ophthalmology. p. 202. Blakiston's. 1927.

EYE MOVEMENT PHOTOGRAPHY

In recent years optometrists have become interested in Eye Movement Photography from an analytical standpoint. A recent commercial application of these studies is the use of eye movement photography to record and analyze readers' interest in magazine text or advertising copy. It was shown by Brandt of Drake University that the relative attention value of various photographs and arrangements of text could be recorded by an instrument similar to the Opthalmograph. LOOK magazine has sponsored this work and has made a number of discoveries of interest to publishers and advertisers. As a reader's attention is steadied by interest in a certain illustration, the duration of time of his fixation is registered on the film by the corneal reflection. The travel of his eye from one subject to another is registered, thus giving an estimate of the eye arresting value of the copy. This information is used as a guide in laying out photographs or advertising copy. "TIDE," an advertising magazine, is now writing a series of articles on tests made by Look's staff with the Brandt eye movement camera.

ORGANIZATION AND JURISPRUDENCE

by Clarence W. Morris

A department in which some of the organization problems of Optometry will be discussed and in which certain of the legal aspects of refractive work will be reviewed.

ORIENTATION OF OPTOMETRIC POLICIES DUE TO FAILURE TO UNDERSTAND PUBLIC RELATIONS

The present orientation of optometric policies reflects a lack of understanding of the essential part public relations is playing in the affairs of the present age. A defense of optometric interests based only on legislation, litigation and publicity or advertising is rather obsolete. The new technique of this modern age is an appeal to the Court of Public Opinion. The Public Relations Counselor is just as essential in pleading a case before this Court as the Legal Counselor is in ordinary litigation. As one studies the orientation of present optometric policies,

it is obvious that the planning has been based on what was a successful technique in the past. The fact that the development of the science of Public Relations has revolutionized the methods of a former generation has made apparently little impression upon those responsible for the present optometric policies.

The essential need for Public Relations has not been realized perhaps because the intimate connection between the field of public relations and other fields of optometric interest is not as yet fully appreciated. The primary fields of optometric interest are education, professional ethics, organization, legislation, jurisprudence and public relations. Education and professional ethics constitute the essential fields. Organization, legislation, jurisprudence and public relations represent agencies the sole purpose of which is to acquire or maintain the objectives in education and professional ethics.

The science of public relations is one of the developments of the last few decades. The fact that this is a new and rather intangible social instrument accounts for the slowness in appreciation for the part public relations is playing in the affairs of the present age. Perhaps the right perspective on public relations will be obtained from a brief survey of it and the other primary fields of optometric interest.

In the field of education we determine the qualifications of the optometrist and his scope of practice. The standards adopted in the field of professional ethics regulate the attitude of the optometrist towards his patient, towards other practitioners and the external environment of his practice. The next step in attaining these desirable objectives was to organize optometrists into associations. Through organization, optometry obtained the enactment of these standards in education and professional ethics into the statutes for the protection of the public. When certain interests questioned the constitutionality of these statutes, we moved into the field of jurisprudence. In the last decade, however, we have a new problem which cannot be solved by legislation or litigation. We find statements appearing in the press which are detrimental to optometric interests. We find certain groups actively encouraging discrimination against optometry. The effect of these activities is to discourage the public from consulting optometrists. Thus indirectly the practice of optometry is made less remunerative and less attractive. Therefore, new men and new investment in optometric education is discouraged which results in retardation in advancement of standards in education and professional ethics. The solution of this problem requires a different

technique from that used in the past.

Public Relations is the answer to the solution of the preceding problem. The anti-optometry propaganda should be neutralized by the presentation of the merits of optometry to the public by well known lay writers. All optometric activity in the fields of education, professional ethics, legislation, and jurisprudence should be interpreted to the public in its true character as contributing to the conservation of vision and the preservation of health. Thus, in a way, public relations becomes an integrating and coordinating agency in all fields of optometric interest. As a consequence the adoption of public relations will secure for optometry an effective medium for acquiring and maintaining the highest possible standards in the fields of education and professional ethics. On the other hand the Public Relations Counselor will seek to interpret optometry to the public through special reports and studies. We find, therefore, the trained Public Relations Counselor taking an interest in all fields of optometric interest in his efforts to create cordial relations between the public and optometry. Furthermore, the adoption of public relations implies an orderly evolution of the profession to attain its ultimate position in the social structure.

The recent development of the field of public relations represents the addition of one more specialty with which optometry must work in the coming years. It seems that the medical profession already recognizes public relations as a specialized aid to them. At the recent National conference on Medical Science on February 11, 1940, one of the speakers was Dr. Edward J. McCormick of Toledo, who is rated as a medical authority on Public Relations. In summarizing his remarks Dr. R. L. Hane writes in the CADUCEUS (March 1940, page 7), "He believes that the field of public relations is a specialized one and our profession can best be served by hiring specialized talent."

The recognition of the field of public relations as a specialty requiring the employment of specialized talent by the medical profession is rather significant. It is equally distressing that while optometry has recognized the importance of employing specialized talent in litigation, in the highly specialized field of public relations we employ optometrists who are not in every sense trained technicians in this work. In 1939 the A.O.A. spent a fair portion at least, of $50,000 for this type of public relations and is now demanding $50,000 for the continuation of this substitute for a genuine public relations program in 1940.

An examination of the record at Los Angeles discloses the fact that

this present A.O.A. public relations program was not, in the writer's opinion, sold to optometry entirely upon its merits. In the writer's judgment, it was sold on a price basis and a bait price basis at that. At Los Angeles this public relations program was sold to optometry on the grounds that it would cost only $15,000; whereas, it was represented that genuine public relations would cost $150,000. The cost of the substitute was not $15,000 but near $50,000 and the cost of a real program of public relations is not $150,000 but $50,000.

In a specialty such as public relations wherein specialized talent is required, the members of the profession should serve on committees in an advisory capacity without pay, in cooperation with paid lay specialists. Whenever an employee is found ineffective he can be promptly discharged. If this work is being done by optometrists instead of lay employees, the attempt to discharge an inefficient optometrist will promptly result in a division between the members of the profession for and against his discharge. The situation is comparable to an optometrist who employs a relative to work for him in his office. If he attempts to discharge this relative, he immediately has a family feud on his hands. Had he hired a stranger, he would be at liberty to maintain efficiency in his office. The employment of lay specialists instead of optometrists will, in the writer's judgment, protect optometry against possible inefficiency and internal dissention.

The adoption of a real program of public relations would actually promote internal strength and unity. But as we examine the activities of some A.O.A. employees we observe that certain of their decisions and policies consistently favor the continuation of the employment of themselves, in place of highly trained lay specialists. One might almost think that the consideration of perpetuating these jobs was the motive behind certain A.O.A. policies. However, it is extremely difficult to believe that any optometrist would place his own personal interests before those of optometry. It is very probable that what appears to be concern about the preservation of certain jobs is the result of defective understanding of the present problems facing optometry in relation to public relations. However, such negligence cannot be condoned indefinitely upon the assumption of ignorance.

As a consequence of the employment of optometrists in place of highly trained lay specialists in public relations work we find our well intentioned and hard working optometric amateurs making the mistakes that might be expected of novices. We observe, for example, that the

mistaken "drops" propaganda is being carried forward in some school text books, in certain national magazines by lay writers, in pamphlets by optical dispensers, by word of mouth through poorly informed welfare agencies, teachers and nurses while the A.O.A. remains ineffective and for the greater part, silent.

And a word relative to the money collected during the last year for public relations activities. There has been no published or easily available account rendered as to how the $45,000 to $50,000 collected in 1939 was disbursed. An accounting should be demanded. The officers of the several state associations should receive a full itemized financial statement on the disbursement of these funds. Furthermore, these funds are not handled through the office of the secretary. Why should such an unusual procedure in handling large sums of association monies be permitted to continue?

Then, too, our A.O.A. officials have presented no budget to show how the $50,000 they demand in 1940 will be disbursed. Those who are asked to give are entitled to know exactly how their money will be spent. Apparently the plan is first to get the money without preparing an anticipated budget for disbursement. Apparently such procedure has been justified in their minds, by the use of the well worn alibi "where is the money coming from?" We would like to ask what organization other than the A.O.A. has the effrontery to ask for $50,000 without presenting the prospective donators an anticipated budget? Take, for example, your community chest drive. Do they not publish exactly the amount they need as an objective? Do they not produce a budget of anticipated disbursements for this same sum? If the community chest drive followed the procedure of the A.O.A. and demanded $50,000 without submitting a budget for disbursements would the drive be a success in your community? Would your community permit such an ambiguous financial policy as we find in the A.O.A.?

We have observed that public relations is a specialty requiring the employment of lay specialists. The material which is to be released for dissemination by a program of public relations must reach the public from a source external to the group it is intended to benefit. In other words public relations is not advertising or mere publicity. While the orientation of optometric policies may be influenced by some misconception of the nature of public relations we find no such misconceptions in other professions. For example, Dr. Hane describes the opinions of Dr. Eward J. McCormick of Toledo at the recent National Conference

on Medical Science in Chicago. Dr. Hane writes, "He thinks propaganda is far more effective when originating from a source outside that which it is supposed to benefit."

Public relations is not publicity or advertising. The Public Relations Counselor prefers to use the news columns for which there is no charge for space. Then also, the Public Relations Counselor knows that the public will eagerly scan most every line of news and will give the advertisements less serious attention. News space and space in national magazines cannot be commanded by "opinions, fanciful claims or propaganda." The material submitted must be based upon facts and have genuine reader interest. This material appears either as news or as special articles under the name of some well known lay writer. Under no circumstances will it appear as sponsored by optometric interests. When we examine the activities of the A.O.A. we find no such indirect publicity used but instead, that which appears to the public as frank advertising. The Public Health Exhibitions and the VISUAL DIGEST are publicly sponsored by optometric interests in behalf of the optometric profession. Such publicity is received by the public as a form of professional advertising. Therefore, its effectivity, according to the opinion of Dr. McCormick, a noted medical authority on public relations, is relatively poor. It is strange that nearly all of the activity of the A.O.A. involves only the ineffective advertising kind of publicity and that up to date the A.O.A. has shown but little interest in an effective use of the indirect type of publicity.

If a vigorous program of public relations is not adopted soon by optometry and the cycloplegic and anti-optometry propaganda continue unabated, individual optometrists and small local organizations will be forced in self defense to present their qualifications and merits directly to the public. This naturally results in professional embarrassment since it is not the height of modesty to handle a situation of this kind in this way. This will result in some dissension between various professional groups and an urgent demand upon optometrists that they tone down their representations, in the interests of better relations between individual practitioners. The net result will be that the merits of optometry will not be well presented to the public while the competing merits of other practitioners continue to be effectively exploited to the public by well directed lay groups and by lay writers which the A.O.A. to date at least has refused to employ in behalf of optometry.

Whatever material optometry has created to present its merits to the public has been of the advertising type and therefore quite ineffective

from that point of view. This material is also ineffective due to poor distribution. The only distribution this material has is that which individual optometrists and local or state optometric associations can give it. The VISUAL DIGEST is an example of defective distribution. Even with full cooperation of every optometrist the VISUAL DIGEST would still be a form of "advertising" and therefore none too effective. The weakness of the VISUAL DIGEST is that it is frankly written by optometrists, published by optometrists, distributed by optometrists—all in behalf of optometric interests. It is pure "advertising" and violates the principle stated by Dr. McCormick that effective propaganda must originate outside the group it is supposed to benefit.

When optometry begins to comprehend the fact that public relations is a specialty, that effective public relations must employ highly specialized lay talent, and that effective publicity must originate outside the group it is intended to benefit, then perhaps the profession will be prepared to give public relations the consideration it merits. Public Relations should receive this consideration at Cincinnati but it remains to be seen if the optometric profession is sufficiently well informed upon the nature and character of public relations to take intelligent action upon this most vital matter.

It is difficult for the writer to understand how a well rounded program of public relations can receive consideration at Cincinnati if the A.O.A. continues to push ahead with the program of spending upon what he believes to be an ineffective substitute, the $50,000, which should, in his judgment, be spent for public relations.

If the committee on public relations submits a report which represents any real further study of the problem, it will be necessary that the committee be provided with sufficient funds to employ a lay specialist in this field to make such a study and formulate the report for the committee. The A.O.A. has made no provision for funds for this committee to finance such needed further study as it authorized the committee to make at Los Angeles.

The adoption of a real program of public relations will mean that the factual and accurate story of optometry will be presented to the public by influential lay writers. Furthermore, the adoption of public relations will insure the effective distribution in national magazines of such lay writing. With the proper exhibition of the merits of optometry by lay writers and an effective distribution of same through national

magazines, there will be no disturbance of the relations between various individual practitioners. Peaceful relations we must have, but peaceful relations at the price of professional existence is a betrayal of both the profession of optometry and public welfare.

BOOK NOTICES

AN INTRODUCTION TO THE MATHEMATICS OF OPHTHALMIC OPTICS. Paul Boeder, Ph.D. Published by the Distinguished Service Foundation of Optometry. Price $2.50. 1940.

To the studious optometrist, this book is indispensable and will permit him to learn again much that he may have forgotten while in college. The recent graduate will find this book a convenient reference to refresh his mind on methods of working out mathematical optics computations. To any optometrist this book can be useful, because it teaches the reader how to perform optical calculations correctly. Its 242 pages consist of brief reviews of fractions, negative numbers, algebra and its optical applications, some trigonometry and its optical application. The examples used by the author are all optical so that the mere process of reading and working out these examples acquaints the reader with the more commonly used formulas of ophthalmic mathematical optics. The optometrist, who finds the study of mathematical optics difficult, will acclaim this little book as his best find in years. G.L.Du.P.

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